On the Phenomena of the Transits of the First Satellite of Jupiter.

By E. E. Barnard.

The elongation of the disc of the first satellite at its transit on August 3, this year, recalls the first theory which I have previously offered in explanation of the apparent duplicity of that satellite at its transit on September 8, 1890.

On August 3 the angle of elongation was about 90° different from that of September 8, and the satellite appeared white in front of a dark belt.

The phenomena of both transits might now be quite satisfactorily explained by the assumption of a white belt on the satellite nearly parallel to the belts of *Jupiter*. To illustrate my idea I have prepared the drawing (Plate 14, fig. 5), which shows the appearance of the satellite on the two dates mentioned, side by side with the possible explanation. The left-hand figure of the upper drawing shows the satellite in double transit on the bright equatorial belt of *Jupiter*, September 8, 1890. The left-hand figure in the lower drawing shows the same object passing before the dark equatorial belt as an elongated white spot, on August 3, 1891.

In the first case, if a bright belt existed on the satellite, it would have the effect of apparently cutting it into two parts, since the belt would be lost in the bright surface of *Jupiter*. The satellite would, therefore, appear as two dusky dots, which, through irradiation, would appear small and round. The upper drawing explains this. In the second case—August 3—the satellite being seen on a dark ground, its dark surface would be lost, and only the bright belt would be seen, the result being just the reverse of the first case. The lower drawing explains this. In other words, if there is a bright belt on I., that satellite will appear double when its transit occurs over a bright part of *Jupiter*, since the dark portions of its surface alone will be visible. When it transits before a dark belt it will appear elongated, the bright belt of the satellite alone being seen.

If the drawing is examined at a distance of six or eight feet, it will clearly illustrate these statements.

Whether the above is the true explanation of the observed phenomena or not must be decided by future observations. The only other alternative is that the satellite is double. In either case the observations certainly establish an important fact. Either the satellite has a bright belt on it similar and nearly parallel to those of *Jupiter*, and, reasoning from analogy, it rotates on an axis nearly perpendicular to the plane of its orbit, or it is actually double.

The true theory can be settled with absolute certainty by careful observations. If the phenomena are caused by a white belt, the satellite, when it transits a bright portion of *Jupiter*,

should always appear double, the apparent components nearly vertical to the belts of *Jupiter*; when it transits a dark belt it should always appear elongated in a line nearly parallel to the belts of *Jupiter*. If it is actually double the elongation or line of apparent duplicity should be seen under all angles.

In reference to the other satellites I have seen nothing to indicate a belt on either of them. I am certain there is nothing of the kind on the 3rd. Though I have often noticed an irregular dark marking on this satellite, I have seen nothing to indicate a belt.

Mount Hamilton:
1891 *August* 6.

Observations of the Solar Eclipse of 1891 *June* 6, *made at the Royal Observatory, Greenwich.*

(*Communicated by the Astronomer-Royal.*)

Observations of the Beginning of the Eclipse.

	G.M.T.				Instrument.	Aperture in ins.	Power.	Observer.
1891.	d	h	m	s				
June	6	5	2	29·3	S.E. Equat.	12·8	295	A.D.
		5	2	24·0	E. Equat.	6·7	220	L.
		5	2	11·7	Altaz.	4	100	A.C.
		5	2	36·0	Simms No. 1	4	75	S.D.

No observations of the end of the Eclipse were made, the Sun being hidden by clouds at the time.

The initials A. D., L., A. C., and S. D. are those of Mr. Downing, Mr. Lewis, Mr. Crommelin, and Mr. Dolman respectively.

During the progress of the Eclipse observations were made with the South-East Equatoreal, with the object of determining corrections to the Moon's tabular R.A. and N.P.D., and to the tabular semidiameters of the Sun and Moon.

The circumstances of this Eclipse were, however, not favourable for determination of corrections to the semidiameters.

The following measures were made by Mr. Downing, the declination microscopes being read by Mr. Thackeray:—

Putting—

$d\alpha$ = correction to Moon's R.A.

$d\delta$ = correction to Moon's N.P.D.

ds = correction to Moon's semidiameter

$d\mathrm{A}$ = correction to Sun's R.A.

$d\Delta$ = correction to Sun's N.P.D.

$d\mathrm{S}$ = correction to Sun's semidiameter